IDENTIFICATION

PRODUCT CODE: MAINDEC-8E-D1EC-D

PRODUCT NAME: MEMORY ADDRESS TEST

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MAINTAINER: DIAGNOSTIC GROUP

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1. ABSTRACT

MEMORY ADDRESS TEST, A RELOCATABLE PROGRAM, CHECKS FOR PROPER MEMORY ADDRESS SELECTION ON THE PDP-8E.

2. REQUIREMENTS

2.1 EQUIPMENT

PDP-8E EQUIPPED WITH A TELETYPE

2.2 STORAGE

MEMORY ADDRESS TEST OCCUPIES LOCATIONS 7200-7507.

AFTER RELOCATING, THE TEST OCCUPIES LOCATIONS 0000-0307.

2.3 PRELIMINARY PROGRAMS

NONE

3. LOADING PROCEDURE

USE STANDARD BINARY LOADER

4. STARTING PROCEDURE

4.1 INITIAL SWITCH SETTINGS

ALL SR'S = 0 RUN ADDRESS TEST HIGH AND RELOCATE PROGRAM AFTER 1 PASS TO ADDRESS TEST LOW AND THEN RELOCATE PROGRAM TO ADDRESS TEST HIGH, REPEATEDLY.

SR0(0) HALT AFTER ERROR PRINTOUT
SR1(1) AND SR2(0) RUN ADDRESS TEST HIGH ONLY
SR1(1) AND SR2(1) RELOCATE PROGRAM AND RUN ADDRESS TEST LOW ONLY
SR1(0) PROGRAM WILL RELOCATE AFTER A PASS
SR1(1) PROGRAM WILL STAY IN TEST AND WILL NOT RELOCATE

4.2 SWITCH SETTINGS AFTER PROGRAM IS RUNNING

SR0(0) HALT AFTER ERROR PRINTOUT
SR1(0) RUN TEST AND RELOCATE
SR1(1) RUN SAME TEST, DO NOT RELOCATE

4.3 STARTING ADDRESSES

0200 INITIALLY

RESTART ADDRESS: 0000,7200

4.4 OPERATOR ACTION

A. SET SR TO 0200 AND PRESS LOAD ADDRESS

B. SET SR FOR DESIRED OPERATION (SEE 4.1) PRESS CLEAR, THEN CONTINUE. FOR MOST CASES THE SWITCH REGISTER SHOULD EQUAL ZERO.

5. OPERATING PROCEDURE

ONCE THE PROGRAM IS RUNNING, THE STARTING ROUTINE IS GIVEN UP FOR A TEST AREA. SR0 AND SR1 ARE THE ONLY SWITCHES THAT HAVE ANY AFFECT ON THE PROGRAM, (SEE 4.2) IN ORDER TO RESTART THE PROGRAM, CERTAIN LOCATIONS MUST BE EXAMINED (SEE BELOW) TO DETERMINE WHERE THE PROGRAM IS, SINCE THE PROGRAM RELOCATES ITSELF FROM ADDRESS TEST HIGH TO ADDRESS TEST LOW AND ADDRESS TEST LOW TO ADDRESS TEST HIGH. IF ADDRESS 0000 CONTAINS A 7300 AND ADDRESS 307 CONTAINS A 7200, START THE PROGRAM AT LOCATION 0000 FOR ADDRESS TEST LOW. IF 7200 AND 7507 HAS 7300 AND 7200 RESPECTIVELY, LOAD ADDRESS 7200 AND SET DESIRED SWITCHES AND HIT CLEAR AND THEN CONTINUE.

6. ERRORS

6.1 ERROR PRINTOUTS

A XXXX C YYYY (ERROR PRINTOUT FORMAT)

A XXXX (ADDRESS) XXXX = ADDRESS CONTAINING WRONG DATA.

C YYYY (CONTENTS) YYYY = CONTENTS OF LOCATION XXXX

THE CONTENTS OF AN ADDRESS SHOULD EQUAL THE ADDRESS OR THE COMPLEMENT OF THE ADDRESS

6.2 ERROR RECOVERY

ANALYSIS OF SEVERAL ERROR PRINTOUTS SHOULD ESTABLISH A MEANINGFUL PATTERN THAT WILL SINGLE OUT A PARTICULAR ADDRESS SELECTION.

IF IT IS NECESSARY TO SCOPE THE PROBLEM, THE FOLLOWING TWO INSTRUCTIONS MAY BE ENTERED IN MEMORY:

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        TAD     (BAD LOCATION)

        JMP     .-1
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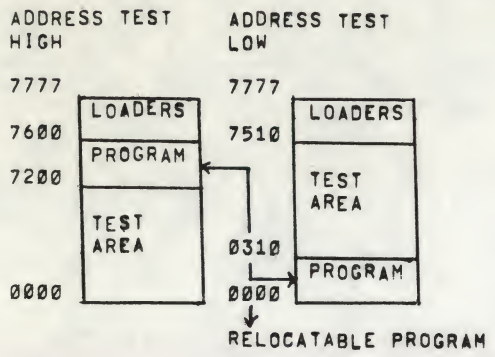
7. MISCELLANEOUS

7.1 EXECUTION TIME

AFTER EVERY 96 COMPLETE PROGRAM LOOPS AN EC IS PRINTED OUT BEFORE THE PROGRAM RELOCATES, EC IS TYPED OUT TWICE, ONCE AFTER ADDRESS TEST HIGH AND THE SECOND TIME AFTER ADDRESS TEST LOW.

7.2 MEMORY MAPS



8. PROGRAM DESCRIPTION

THE PROGRAM CONSIST OF TWO PHASES WHICH OCCUR IN THE FOLLOWING SEQUENCE:

PHASE 1 LOAD MEMORY SEQUENTIALLY IN THE FORWARD DIRECTION WITH EACH ADDRESS EQUAL TO ITS CONTENTS, THEN READ AND CHECK MEMORY FOR ERRORS.

PHASE 2 LOAD MEMORY SEQUENTIALLY IN THE REVERSE DIRECTION WITH ONE'S COMPLEMENT OF EACH ADDRESS, THEN READ AND CHECK MEMORY FOR ERRORS.

IN PHASE ONE, THE CONTENTS OF EVERY LOCATION IN THE TEST AREA IS EQUAL TO ITS ADDRESS. IF AN ERROR OUCCURS, THE CONTENTS WERE PROBABLY DEPOSITED INTO A WRONG ADDRESS OR MULTIBLE ADDRESSES, IN PHASE 2 THE MEMORY IS LOADED WITH THE ONE'S COMPLEMENT OF THE ADDRESS, IF THE ADDRESS OR ITS COMPLEMENT IS WRONG, A ERROR MESSAGE WILL BE TYPED OUT GIVING THE FAILING ADDRESS AND ITS CONTENTS.

BETWEEN PHASE 1 AND PHASE 2 EACH ADDRESS IS CHECKED WITH THE ADDRESS EQUAL TO ITS ADDRESS WITH ALL OTHER BITS A ZERO, AND THEN WITH THE ADDRESS BITS EQUAL TO A ZERO AND ALL OTHER BITS SET TO A ONE. THIS CHECKS EACH ADDRESS FOR BIT DROPOUT OR PICKUP OF ALL BITS OF AN ADDRESS.

SAMPLE ERROR PRINTOUT:

A2560 C2760

EXPLANATION - WHILE ATTEMPTING TO WRITE A 2760 INTO LOCATION 2760, THE DATA WAS WRITTEN INTO LOCATION 2560. BIT FOUR WAS DROPPED.

SAMPLE ERROR PRINTOUT:

A2560 C5207

EXPLANATION - WHILE ATTEMPTING TO WRITE THE COMPLEMENT OF 2560 (5217) INTO LOCATION 2560, 5207 WAS WRITTEN INTO THE LOCATION INSTEAD. BIT 8 WAS DROPPED.

AFTER 96 PROGRAM LOOPS OF PHASES 1-4 THE PROGRAM RELOCATES AND RUNS ANOTHER 96 PROGRAM LOOPS BEFORE IT RELOCATES AGAIN.

ADDRESS TEST HIGH - TEST MEMORY LOCATIONS 0000-7177.

ADDRESS TEST LOW - TEST MEMORY LOCATIONS 310-7510.

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                        /PDP-8E MEMORY ADDRESS TEST
            0000        *0000
0000        0000        0
0001        5001        JMP 1
0002        0002        2
0003        0003        3
0004        0000        0
0005        0000        0
            0200        *200
0200        7604        BEG,    LAS
0201        7440                SZA
0202        5204                JMP .+2
0203        5615                JMP I START     /SR=0 RUN PROGRAM AND RELOCATE
0204        1217                TAD M2000
0205        7640                SZA CLA
0206        5210                JMP .+2
0207        5615                JMP I START     /RUN MEMORY ADDRESS TEST HIGH
0210        7604                LAS
0211        1220                TAD M3000
0212        7640                SZA CLA
0213        5615                JMP I START             /WRONG SWITCH SETTING RUN HIGH AND RELOCATE
0214        5616                JMP I LOWER     /RELOCATES PROGRAM AND RUNS MEMORY ADDRESS TEST HIGH
0215        7200    START,      LOADUP
0216        7405    LOWER,      MOVELH
0217        6000    M2000,      -2000
0220        5000    M3000,      -3000

            7200        *7200

                        /LOAD MEMORY FORWARD DIRECTION


7200        7300    LOADUP,     CLA CLL
7201        1277                TAD LIMLO
7202        3275                DCA ADRES               /SET TEST AREA STARTING ADDRESS
7203        1300                TAD M7200
7204        3305                DCA CTR
7205        1275                TAD ADRES
7206        3675                DCA I ADRES     /DEPOSIT ADDRESS IN CONTENTS
7207        2275                ISZ ADRES
7210        2305                ISZ CTR
7211        5205                JMP LOADUP+5
7212        1277                TAD LIMLO
7213        3275                DCA ADRES
7214        1300                TAD M7200
7215        3305                DCA CTR

7216        1675    MEMLUP,     TAD I ADRES     /GET CONTENTS FORWARD DIRECTION
7217        7041                CIA
7220        1275                TAD ADRES               /GET ADDRESS
7221        7640                SZA CLA         /SKIP IF EQUAL
7222        4520                JMS ERROR               /CONTENTS NOT SAME AS ADDRESS
7223        2275                ISZ ADRES               /SELECT NEXT ADDRESS
7224        2305                ISZ CTR         /SKIP IF END TEST AREA
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7225  5216          JMP MEMLUP

                /LOAD MEMORY REVERSE DIRECTION
7226  1276  LOADWN, TAD LIMHI
7227  3275          DCA ADRES               /SET TEST AREA ENDING ADDRESS
7230  1300          TAD M7200
7231  3305          DCA CTR
7232  1275          TAD ADRES
7233  7040          CMA
7234  3675          DCA I ADRES     /DEPOSIT 1'S COMPLEMENT OF ADDRESS IN ADDRESS
7235  7240          CLA CMA         /AC=-1
7236  1275          TAD ADRES               /AC=(ADRES)-1
7237  3275          DCA ADRES               /DECREMENT ADDRESS
7240  2305          ISZ CTR         /SKIP WHEN LOWER LIMIT REACHED
7241  5232          JMP LOADWN+4
7242  1300          TAD M7200
7243  3305          DCA CTR


                /SEQUENTIAL LOCATION TEST (DOWN)
7244  1276  LOOP2,  TAD LIMHI
7245  3275          DCA ADRES               /SET STARTING ADDRESS
7246  1675          TAD I ADRES     /GET CONTENTS
7247  7001          IAC
7250  1275          TAD ADRES               /GET ADDRESS
7251  7640          SZA CLA         /SKIP IF EQUAL
7252  4320          JMS ERROR               /CONTENTS NOT COMPLEMENT OF ADDRESS
7253  7240          CLA CMA         /AC=-1
7254  1275          TAD ADRES               /AC=(ADRES)-1
7255  3275          DCA ADRES               /SELECT NEXT ADDRESS
7256  2305          ISZ CTR         /SKIP IF END TEST AREA
7257  5246          JMP LOOP2+2
7260  2301          ISZ COUNT
7261  5200          JMP LOADUP
7262  1302          TAD RESTOR
7263  3301          DCA COUNT
7264  1312          TAD CR
7265  4343          JMS PRINT
7266  1313          TAD LF
7267  4343          JMS PRINT
7270  1303          TAD K305
7271  4343          JMS PRINT
7272  1316          TAD C
7273  4343          JMS PRINT
7274  5377          JMP  BANK1

                /CONSTANTS AND VARIABLES
7275  0000  ADRES,  0
7276  7177  LIMHI,  7177
7277  0000  LIMLO,  0
7300  0600  M7200,  -7200

7301  7640  COUNT,  -140
7302  7640  RESTOR, -140
7303  0305  K305,   305
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7304  7774  M4,     -4
7305  0000  CTR,    0
7306  0007  MSK7,   7
7307  0260  TW6,    260
7310  0000  STOR,   0
7311  7004  NUM,    RAL
7312  0215  CR,     215
7313  0212  LF,     212
7314  0240  SPACE,  240
7315  0301  A,      301
7316  0303  C,      303
7317  0000  CNT,    0


                    /ERROR MESSAGE
7320  0000  ERROR,  0
7321  1312          TAD CR
7322  4343          JMS PRINT
7323  1313          TAD LF
7324  4343          JMS PRINT
7325  1315          TAD A
7326  4343          JMS PRINT
7327  1275          TAD ADRES
7330  4351          JMS TYPAC
7331  1314          TAD SPACE
7332  4343          JMS PRINT
7333  1316          TAD C
7334  4343          JMS PRINT
7335  1675          TAD I ADRES
7336  4351          JMS TYPAC
7337  7604          LAS
7340  7700          SMA CLA
7341  7402          HLT                 /HALT ON ERROR (SR0)
7342  5720          JMP I ERROR

7343  0000  PRINT,  0
7344  6046          TLS
7345  6041          TSF
7346  5345          JMP .-1
7347  7200          CLA
7350  5743          JMP I PRINT


                    /TYPE (AC) IN OCTAL

7351  0000  TYPAC,  0
7352  3310          DCA STOR
7353  1361          TAD BACK+1
7354  3362          DCA BACK+2
7355  1304          TAD M4
7356  3317          DCA CNT
7357  7100          CLL
7360  1310  BACK,   TAD STOR
7361  7006          RTL
7362  7006          RTL
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7363  3310          DCA STOR
7364  1310          TAD STOR
7365  0306          AND MSK7
7366  1307          TAD TW6
7367  4343          JMS PRINT
7370  1311          TAD NUM
7371  3362          DCA BACK+2
7372  2317          ISZ CNT
7373  5360          JMP BACK
7374  5751          JMP I TYPAC
      7377    *7377
7377  7000    BANK1,  NOP

7400  7604          LAS             /LOOK AT SR TO SEE IF PROGRAM RELOCATES
7401  0257          AND COMP
7402  7650          SNA CLA
7403  5205          JMP MOVELH      /JMP TO MOVE ROUTINE
7404  5277          JMP  LOADP      /KEEP PROGRAM IN SAME AREA
7405  1264    MOVELH, TAD STORE
7406  7040          CMA
7407  3264          DCA STORE
7410  1264          TAD STORE
7411  7700          SMA CLA
7412  5236          JMP MOVEH       /RELOCATES PROGRAM TO HIGH MEMORY
7413  5214          JMP MOVEL       /RELOCATES PROGRAM TO LOW MEMORY
7414  7300    MOVEL,  CLA CLL
7415  1260          TAD LIMLOL
7416  3673          DCA I X1        /LOW ADDRESS UNDER TEST=310
7417  1261          TAD LIMHIL
7420  3674          DCA I X2        /HIGH ADDRESS UNDER TEST=7510
7421  7300    SETL,   CLA CLL       /SETS UP COUNTERS FOR MOVING
7422  3265          DCA CONT1
7423  1262          TAD CNT2
7424  3266          DCA CONT2
7425  1263          TAD HGH
7426  3267          DCA HIGH
7427  1667    MOVITL, TAD I HIGH    /MOVES PROGRAM TO LOWER MEMORY
7430  3665          DCA I CONT1
7431  2265          ISZ CONT1
7432  2267          ISZ HIGH
7433  2266          ISZ CONT2       /IS PROGRAM RELOCATED
7434  5227          JMP MOVITL      /NO
7435  5000          JMP 0           /YES START PROGRAM
7436  1270    MOVEH,  TAD LIMLOH
7437  3675          DCA I X3        /LOW ADDRESS UNDER TEST=0000
7440  1271          TAD LIMHIH
7441  3676          DCA I X4        /HIGH ADDRESS UNDER TEST=7177
7442  7300    SETH,   CLA CLL       /RESETS COUNTERS
7443  3272          DCA LOW
7444  1262          TAD CNT2
7445  3266          DCA CONT2
7446  1263          TAD HGH
7447  3267          DCA HIGH
7450  1672    MOVITH, TAD I LOW     /MOVE PROGRAM TO UPPER MEMORY
7451  3667          DCA I HIGH
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7452  2272            ISZ LOW
7453  2267            ISZ HIGH
7454  2266            ISZ CONT2       /IS PROGRAM RELOCATED
7455  5250            JMP MOVITH      /NO
7456  5663            JMP I HGH       /YES START PROGRAM
7457  2000  COMP,     2000
7460  0310  LIMLOL,   0310
7461  7510  LIMHIL,   7510
7462  7470  CNT2,     7470
7463  7200  HGH,      7200
7464  0000  STORE,    0
7465  0000  CONT1,    0
7466  7470  CONT2,    7470
7467  7200  HIGH,     7200
7470  0000  LIMLOH,   0
7471  7177  LIMHIH,   7177
7472  0000  LOW,      0
7473  7277  X1,       LIMLO
7474  7276  X2,       LIMHI
7475  0077  X3,       0077
7476  0076  X4,       0076
7477  7000  LOADP,    NOP
7500  4301            JMS .+1
7501  0000            0
7502  1301            TAD .-1
7503  0307            AND STAY
7504  7700            SMA CLA
7505  5000            JMP 0
7506  5707            JMP I STAY
7507  7200  STAY,     7200
            $
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